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Awareness of sunburn in childhood and use of sunbeds as risk factors and change of moles as a symptom for melanoma in Denmark, Northern Ireland, Norway and Sweden

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Abstract 249 words

Background: Malignant melanoma (MM) is increasing rapidly in Northern Europe. To reduce incidence and mortality through earlier diagnosis, public awareness of MM is important. Thus, we aim to examine awareness of risk factors and a symptom of MM, and how awareness varies by country and sociodemographic factors in Denmark, Northern Ireland (NI), Norway and Sweden.

Method: Population-based telephone interviews using the "Awareness and Beliefs about Cancer" measure were conducted in 2011 among 8355 adults ≥50 years as part of the International Cancer Benchmarking Partnership Module 2. Prevalence ratios (PRs) with 95% confidence intervals were calculated.

Results: In these four countries, lowest awareness was found for *sunburn in childhood* (63%), whereas awareness was high for *use of sunbeds* (91%) *and mole change* (97%). Lack of awareness of *sunburn in childhood* was more prevalent among respondents from Norway [PR =1.38 (1.28-1.48)] but less prevalent among respondents from Northern Ireland (NI) [PR=0.78 (0.72-0.85)] and Sweden [PR=0.86 (0.79-0.93)] compared to respondents from Denmark. Lack of awareness of *use of sunbeds* was more prevalent among respondents from Norway [PR=2.99 (2.39-3.74)], Sweden [PR=1.57 (1.22-2.00)], and NI [PR=1.65 (1.30-2.10)] compared to respondents form Denmark. Being a man, age ≥70, living alone, and having lower education, were each independently associated with lack of MM-awareness.

Conclusion: The results indicate relatively low awareness of *sunburn in childhood* as a risk factor for MM, and important disparities in MM-awareness across countries and sociodemographic groups. Improved and more directed initiatives to enhance public MM-awareness, particularly about *sunburn in childhood*, are needed.

Key words: malignant melanoma, awareness, risk factors, symptom, campaigns, ecological study, telephone survey

Introduction

Malignant skin melanoma (MM) is one of the most rapidly increasing cancers among western Caucasian populations (1). Effective primary and secondary prevention initiatives are important to reduce MM incidence, morbidity and mortality. Primary prevention aims to raise awareness of risk factors (e.g. ultraviolet radiation from sun exposure and sunbeds) (2), with the assumption that people may then adopt sun-protective behaviours (3). However, studies focusing on sun protection among children and adolescents have shown that despite increased knowledge about risks of sun exposure, the effects on protective sun behaviour are short-lived and decline as children become older (4, 5). Nevertheless, it is argued that the widespread Australian sun-safe campaigns have had some positive effect on skin cancer incidence (3, 6) which indicates likely effects of such campaigns on public awareness and behaviour.

Secondary MM prevention focuses on early detection to decrease morbidity and mortality. Awareness of early symptoms of MM may lead to healthcare-seeking in early disease stages, with improved prognosis (7). To promote awareness of risk factors and early detection, some European countries have driven “Euromelanoma” campaigns (8). Euromelanoma has had a significant impact on early diagnosis of MM and has improved public health attitudes towards regular mole examination (8). Similar campaigns have led to increased awareness of MM in other countries (9, 10).

MM is reported to be more common among people with higher socioeconomic status (SES), possibly related to greater opportunities for sun holidays (11). However, lower education is associated with later stages at diagnosis and poorer prognosis (12), which Pollitt *et al*. (13)

argue may result from lower awareness about risks and symptoms. Youl *et al.* (14) concluded that early detection and skin examination messages seem to more effectively reach people with higher education levels.

Denmark, Northern Ireland, Norway, and Sweden are among the countries with the highest MM-incidence (world age-standardised ratios – ASR(W): 19.2; 14.5; 18.8 and 18.0/100 000, respectively) and mortality from MM (ASR(W): 2.1; 2.0; 3.6 and 2.6/100 000, respectively) in Europe (15, 16). The high MM-incidence in these countries thus indicates a need to improve preventive efforts.

These northern European countries were among those participating in the International Cancer Benchmarking Partnership (ICBP) (17). ICBP's five modules examine different issues related to diagnosis of and survival from cancer in Australia, Canada, Denmark, England, Northern Ireland (NI), Norway, Sweden, and Wales, to identify possible reasons for differences between settings and to generate knowledge for optimization of cancer policies and services. The study presented here is based on optional ICBP Module 2 data collected on cancer risk factors awareness by these four countries only, to complement the core survey focusing on public awareness and beliefs about cancer and perceived barriers to healthcare-seeking. This optional section provides baseline data for preventive efforts to diminish incidence and mortality of common cancers.

Using ICBP data, the aims of this study are to (1) describe awareness of risk factors (*use of sunbeds* and *sunburn in childhood*) and a cardinal symptom of MM (*mole change*) in Denmark, NI, Norway and Sweden, and (2) analyze how country of residence and

sociodemographic factors are associated with reported MM risk factor and symptom awareness.

Methods

Data Collection

Data derive from the ICBP Module 2 (17, 18) population-based survey of the general public's awareness and beliefs about cancer. Data collection was performed using computer-assisted telephone interviews by trained native language speakers. Interviews were conducted in Denmark and NI in May-July 2011 and in Norway and Sweden in August-September 2011.

The target recruitment was 2000 respondents aged ≥50 from the general population in each country, although minor country-specific variations were necessary in recruitment processes. In NI potential respondents were identified through a random probability sample of people aged ≥50 in private households, stratified by region. Households were telephoned using random computer-generated telephone numbers. The person who answered the phone was asked about the age and number of people in the household to identify persons ≥50 years. Where more than one person met this criterion, the Rizzo method (19) was used to randomly select one person for interview. In Denmark, Norway and Sweden, samples were randomly selected from national population registers. Names and/or addresses as listed in the registers were supplemented with landline and/or mobile phone numbers by national market research- and consulting firms from each country. In all four countries each telephone number was called up to seven times at different times of the day for study recruitment. Interviews were not performed if the person was unable to speak or understand the official language of the country. The total number of completed interviews were 2307 in NI, 2000 in Denmark, 2009 in Norway and 2039 in Sweden. The estimated response rates, where the denominator is

adjusted for the likely proportion of eligible households, varied from 20.4% in NI and 23.2% in Norway, to 28.0% in Sweden and 38.2% in Denmark (20).

The Awareness and Beliefs about Cancer (ABC) instrument (18) was the basis for the interviews. It consists of a core section covering questions on awareness and beliefs about cancer and perceived barriers to healthcare-seeking. One of 11 items regarding awareness of cancer symptoms, called *mole change* here, refers to a cardinal MM symptom and was posed as follows: "Do you think a change in the appearance of a mole could be a sign of cancer?" (response options: *Yes*, *No*).

The question related to risk factors was worded as follows: "I am now going to read out a list of things which may or may not increase a person's chances of getting cancer in general. For each one can you tell me how much you agree or disagree that it may increase your chances of getting cancer?" The response options were: *strongly disagree, tend to disagree, tend to agree, strongly agree.* Two of the 13 risk factors listed focused specifically on awareness of risk factors for MM: *Getting sunburnt more than once as a child* (called *sunburn in childhood* here) and *use of sunbeds*. There was no set option for *don't know*, but such responses were documented by the interviewers. Data were also obtained on sociodemographic variables, e.g. age, gender, cohabitation, and education.

Ethics

The national studies received necessary approvals from relevant agencies in Denmark: (Danish Data Protection Agency (J. no. 2011-41-6237) and Danish Health and Medicines Authority); Sweden: (Research ethics committee at Karolinska Institutet (Ref. no. 2011/699-31/2)); NI: (Queens University Belfast School of Medicine, Dentistry and Biomedical

Sciences research ethics committee, May 2011); and Norway: (Norwegian Social Sciences Data Services).

Study variables and statistical analysis

Response options for questions regarding risk factors (*sunburn in childhood* and *use of sunbeds)* were dichotomised into *awareness* ("tend to agree"/"strongly agree") versus *lack of awareness* ("tend to disagree"/"strongly disagree"/"don't know"), respectively. Awareness of the symptom *mole change* was categorized as *awareness* ("yes") versus *lack of awareness* ("no"/"don't know"). Missing data, which varied from 0-4%, were excluded from analysis.

Sociodemographic variables were dichotomised for analyses as follows: age: *50-69 years* versus *≥70 years;* cohabitation: *living with a partner* (married/in other partnership) versus *living without a partner* (single/divorced/separated/widowed/not living with a partner); and education: *higher education* (Bachelor degree and above) versus *lower education*.

Lack of MM-awareness (MM symptom and/or risk factors) are outcome variables in the analyses. Descriptive statistics are used to present distribution of risk factor awareness and symptom awareness among respondents by country. Prevalence ratios (PR) with 95% confidence intervals (CI) were estimated by multiple log-binomial regression modelling to examine effect of country and sociodemographic factors on the outcome variables. In a first model we examined the association between the outcome variables and country and sociodemographic variables (gender, age, cohabitation and education) within the total sample. In this model the estimates were adjusted for all sociodemographic variables and country. In a second set of models, the associations between outcome variables and sociodemographic variables were examined within each country separately, adjusting for all sociodemographic

variables. Analyses were performed using IBM SPSS statistics 20 and SAS 9.3. Statistical significance was specified as $p \leq 0.05$.

Results

With the exception of Norway, a higher proportion of the respondents - were women (range: 46-64%). Mean age was 63 years with little inter-country variation. On average, 33% reported higher education, with lowest proportion in NI (23%) and highest in Norway (47%). Furthermore, 32% reported living without a partner, with lowest proportion in Denmark (24%) and highest in NI (44%) (Table 1).

Insert Table 1 here.

In general, the lowest awareness was found for *sunburn in childhood* (63%), particularly among respondents from Norway (48%), where also significantly lower awareness of *use of sunbeds* was found (86%). The highest awareness was found for *mole change* (97%) with no inter-country variation (Table 2).

Insert Table 2 here

Based on multiple regression analyses (Table 3), in the total sample, all sociodemographic characteristics except cohabitation were associated with lack of awareness of *sunburn in childhood* as a MM risk factor. Higher prevalence of lacking awareness of this risk factor was found among men compared to women in all countries while in Sweden and Denmark lack of awareness was more prevalent among those ≥70 years and those with lower education.

The only characteristic not significantly associated with lack of awareness of *use of sunbeds* was gender, while having lower education (Denmark, NI), living without a partner (Denmark, Sweden) and age ≥70 (NI, Sweden) were all significantly associated (Table 3).

Insert Table 3 here

None of the countries differed significantly from the level of MM symptom awareness reported in Denmark (Table 3). In the total respondent group, lack of awareness was more prevalent among respondents who were men, had lower education, lived without a partner, and were aged ≥70. This was also the case among the Danish and NI respondents. In Sweden lower education and living without a partner were associated with lacking awareness of this symptom, while in Norway being a man was the only associated characteristic.

Discussion

In this population-based study comprising 8355 respondents from Denmark, NI, Norway and Sweden, we found high awareness of *mole change* as a possible cancer symptom. In all countries, *use of sunbeds* was recognised as a cancer risk factor more than *sunburn in childhood*. Lower MM-awareness was found among men, and respondents who were ≥70 years, lived without a partner and had lower education. Norwegian respondents had lowest awareness of risk factors for MM.

While symptom awareness was relatively high in all countries, there was variation in awareness of risk factors between countries. Respondents from Norway reported lowest awareness of both *sunburn in childhood* and *use of sunbeds*, whereas respondents from NI

reported highest awareness of *sunburn in childhood* and respondents from Denmark highest awareness of *use of sunbeds*. One possible explanation for these high levels of awareness of risk factors might be active multi-sun-related preventive activities. Ongoing campaigns in NI have been both widespread and varied since the 1990s, targeting preschool children, their parents and the general public, identifying sunburn in children as a risk factor, with focus on farmers, vacationers, and outdoor workers to encourage care in the sun and mole awareness (21). Despite a generally high level of knowledge about skin cancer in NI (9), MM-incidence is still increasing (16), which may be explained by the lag between UV-exposure and incidence. Broad sun-preventive activities have also been carried out in Sweden since the 1980s but during the last decade these have not been as intensive as in Denmark (2, 8, 22-24). In Norway however, MM-related campaigns, which started during the 1990s, have mainly focused on sunscreen use among adolescents, employees in kindergartens, children and their parents (personal communication with Mona Stensrud, 2013 Norwegian Cancer Society), and have not been directed to the general public as in NI, thereby virtually excluding the age group in this study. Interestingly, since 1990 MM-incidence in Norway has decreased among younger people while, as in NI, it continues to increase among those >50 years. Possible explanations for this might include changed sun exposure patterns with more indoor activities among younger people, and may, in relatively well-to-do Norway, reflect an increase in vacations and outdoor activities among those >50 years (25). We argue that those >50 years should not be neglected, as they are parents, teachers and grandparents of children with a role in prevention of future cancers complementing that of policy makers. Awareness of risk factors and mole change in this age group is also important as MM becomes increasingly common with age; awareness can help people relate their previous sun/sunbed exposure to MM risk and perhaps facilitate quicker response to mole change.

Analysing trends of MM-incidence in Europe from 1990-2006/7, Arnold *et al*. (1) concluded that primary and secondary prevention can avert and possibly reduce the increasing MM-burden in European countries. Such prevention requires knowledge of risk factors as a starting point. The importance of repeated, broad campaigns for both primary and secondary MM-prevention has been shown (3, 6) and suggested (26) in several studies. Based on the levels of awareness of risk factors found here, especially of *sunburn in childhood*, and the lower levels in some population groups, combined with the high MM-incidence and mortality in these Northern European countries (15, 16), we argue that there is a need for more preventive initiatives to increase awareness of MM.

The high awareness of *mole change* found here is in line with previous studies from other countries (Germany, Australia, Sweden, Brazil, France, England) showing this is a well-known MM symptom (10, 26, 27). One reason why *sunburn in childhood* was a less well-known risk factor might be because this has been highlighted more recently (28, 29). Since MM is linked with sunburn, especially before age 14 (29, 30), these results suggest that new and innovative means of communicating this message to the general public is warranted.

The highest reported awareness of *use of sunbeds* was in Denmark, where the anti-sunbed campaign seems to have led to decreased use among the youngest age groups (24). In Norway, where we found the lowest awareness, sunbed use has increased in all ages (25). The lower awareness of cancer risk from sunbed use found in Norway may reflect the comparatively shorter time for campaign activity which did not target the general public.

The sociodemographic patterns found here are supported by previous studies reporting lower awareness of risk factors and higher risk for advanced stages of MM among middle-aged and

older men (31), men living alone (32), and higher awareness and information seeking about MM among women (31). This latter finding might be related to gender roles, with women often more active in childcare and thus more likely to be recipients of prevention messages targeting children. They may also be more active in seeking such information and more interested in skin care generally. The finding of lack of MM-awareness among people with lower education is in line with other studies, which suggest that later stage MM-diagnosis among people with low SES might be related to lower awareness and perception of MM-risks, although increased difficulties in interactions with the healthcare system may also play a part (13, 14). A recent review from Northern Europe found that people with lower SES use sunbeds more frequently than those with high SES (33). Paradoxically, people with higher SES have both higher MM-incidence and higher survival rates than people with lower SES. Higher intermittent sun-exposure on sun holidays might be related to the higher incidence, while higher survival may be explained by higher awareness, access, and utilization of healthcare (11, 33). Differences in MM-awareness between sociodemographic groups found in this study may relate to the content of health promotion campaigns. This work suggests that directed efforts are required to improve awareness of behaviour risks, and mole change.

A major strength of this study is that data has been generated from the general population, with all countries using a jointly developed and validated instrument to measure cancer awareness (18), facilitating comparisons between countries. However, while 2000 respondents from each country allows adequate power (34), the response rates were relatively low and varied somewhat between countries, which may in part relate to differences in recruitment methods of respondents. In Scandinavian countries, telephone surveys often achieve higher response rates when preceded by an introductory letter (35). This was not done here as we sought consistency in survey methods (34).

There are some deviations in representativeness of respondents, especially in NI and Norway, with gender and level of education distribution differing in comparison to official population statistics in each country (36-39). However, multiple regression analysis was used to adjust for this effect. Weighting was not used since previous research with the IBCP Module 2 data found that this procedure did not significantly influence results concerning cancer awareness and beliefs (34). Furthermore, the survey design may cause selection bias leading to overestimation of awareness, since people with higher education and interest in health issues more often participate in surveys (40). Exclusion of people not speaking the official country language implies that people with particular difficulty in accessing information and healthcare are under-represented here.

Furthermore, it should, be recognized that this is an ecological study, and, despite having information at a country level on health campaigns relating to care in the sun and skin cancers, we lack specific data on exposure to MM-related information through campaigns or other channels among the respondents. It is e.g. possible that the higher level of awareness among the NI respondents may reflect targeting the population with messages of avoiding sunburn in childhood. However, while our results suggest associations between the extents to which countries have actively worked with broad campaigns and level of MM-awareness, our design does not allow us to draw conclusions regarding effects of these campaigns on public awareness and ultimately behaviour.

In conclusion, there are differences in MM-awareness between countries and sociodemographic groups, although awareness of *mole change* was consistently high in all countries. These differences and the relatively low awareness of *sunburn in childhood* as a

risk factor for MM indicate a need for improved and more directed initiatives to enhance MM-awareness among groups with lower awareness.

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Conflicts of interests:

None declared

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Key points

- Denmark, Sweden, Norway and Northern Ireland are among the countries with the highest malignant melanoma (MM) incidence in Europe
- Public awareness of *mole change* as a symptom of MM was high in these four Northern European countries. The disparity between countries and sociodemographic groups in awareness of MM risk factors (*sunburn in childhood* and *use of sunbeds*) points to a varying need in these countries to increase awareness of MM and to target groups with lower awareness, i.e. people who have lower education, are older and men
- Awareness of *sunburn in childhood* as a risk factor for MM was considerably lower than both awareness of *use of sunbeds* and awareness of *mole change* in all countries, which calls for more efficient strategies for educating the general public about this risk factor
- Although several MM-campaigns have been conducted in these countries awareness of MM is still lower among people with lower education

Table 1. Sociodemographic characteristics of the 8355 respondents from Denmark, Northern Ireland, Norway and Sweden.

	All countries	**Denmark**	**NI***	**Norway**	**Sweden**
	N=8355	**N=2000**	**N=2307**	**N=2009**	**N=2039**
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
	[95% CI]	[95% CI]	[95% CI]	[95% CI]	[95% CI]
Gender					
Women	*4582* (54.8)	*1065* (53.3)	*1474* (63.9)	*932* (46.4)	*1111* (54.5)
	[53.7-55.9]	[51.1-55.5]	[61.9-65.9]	[44.2-48.6]	[52.3-56.7]
Men	*3773* (45.2)	*935* (46.8)	*833* (36.1)	*1077* (53.6)	*928* (45.5)
	[44.1-46.3]	[44.5-48.9]	[34.1-38.1]	[51.4-55.8]	[43.3-47.7]
Age					
Mean (SD)	63.49 (9.2)	63.4 (8.9)	63.6 (9.5)	64.2 (9.2)	64.8 (9.2)
Age groups					
50-69 years	*6175* (74.0)	*1510* (75.5)	*1705* (74.1)	*1491* (74.2)	*1469* (72.0)
	[73.1-74.9]	[73.6-77.4]	[72.3-75.9]	[72.3-76.1]	[70.1-73.9]
≥70 years	*2175* (26.0)	*490* (24.5)	*597* (25.9)	*518* (25.8)	*570* (28.0)
	[25.1-26.9]	[22.6-26.4]	[24.1-27.7]	[23.9-27.7]	[26.1-29.9]
Missing	*1*	-	*5*	-	-
Education					
Lower education	*5479* (66.6)	*1404* (70.7)	*1712* (77.2)	*1062* (53.4)	*1301* (64.1)
	[65.6-67.6]	[68.7-72.7]	[75.5-78.9]	[51.2-55.6]	[62.0-66.2]
Higher education	*2743* (33.4)	*582* (29.3)	*505* (22.8)	*927* (46.6)	*729* (35.9)
	[32.4-34.4]	[27.3-31.3]	[21.1-24.5]	[44.4-48.8]	[33.8-38.0]
Missing	*133*	*14*	*90*	*20*	*9*
Cohabitation					
Living with a partner	*5688* (68.2)	*1514* (75.8)	*1289* (56.2)	*1453* (72.4)	*1432* (70.3)

	[67.2-69.2]	[73.9-77.7]	[54.2-58.2]	[70.4-74.4]	[68.3-72.3]
Living without a partner	*2648* (31.8)	*484* (24.2)	*1006* (43.8)	*553* (27.6)	*605* (29.7)
	[30.8-32.8]	[22.3-26.1]	[41.8-45.8]	[25.6-29.6]	[27.7-31.7]
Missing	*19*	*2*	*12*	*3*	*2*

***** Northern Ireland.

Percentages are based on valid data.

Table 2. Distribution of awareness of risk factors and awareness of symptom of MM.

Awareness of MM	**All countries**	**Denmark**	**NI***	**Norway**	**Sweden**
	N=8355	**N=2000**	**N=2307**	**N=2009**	**N=2039**
	n (%)	*n* (%)	*n* (%)	*n* (%)	*n* (%)
	[95% CI]	[95% CI]	[95% CI]	[95% CI]	[95% CI]
Sunburn in childhood					
Awareness	*5227* (62.6)	*1251* (62.6)	*1628* (70.6)	*964* (48.1)	*1384* (67.9)
	[61.6-63.6]	[60.5-64.7]	[68.7-72.5]	[45.9-50.3]	[65.9-69.9]
Lack of awareness	*3118* (37.4)	*748* (37.4)	*678* (29.4)	*1039* (51.9)	*653* (32.1)
	[36.4-38.4]	[35.3-39.5]	[27.5-31.3]	[49.7-54.1]	[30.1-34.1]
Missing	*10*	*1*	*1*	*6*	*2*
Use of sunbed					
Awareness	*7605* (91.1)	*1902* (95.1)	*2097* (90.9)	*1724* (85.9)	*1882* (92.3)
	[90.5-91.7]	[94.2-96.0]	[89.7-92.1]	[84.4-87.4]	[91.1-93.5]
Lack of awareness	*746* (8.9)	*98* (4.9)	*210* (9.1)	*282* (14.1)	*156* (7.7)
	[8.3-9.5]	[4.0-5.8]	[7.9-10.3]	[12.6-15.6]	[6.5-8.9]
Missing	*4*	-	-	*3*	*1*
Mole change					
Awareness	*8085* (96.8)	*1939* (97.0)	*2235* (96.9)	*1956* (97.4)	*1955* (95.9)
	[96.4-97.2]	[96.3-97.7]	[96.2-97.6]	[96.7 -98.1]	[95.0-96.8]
Lack of awareness	*268* (3.2)	*60* (3.0)	*72* (3.1)	*52* (2.6)	*84* (4.1)
	[2.8-3.6]	[2.3-3.7]	[2.4-3.8]	[1.9-3.3]	[3.2-5.0]
Missing	*2*	*1*	-	*1*	-

***** Northern Ireland

Table 3. Multivariable regression analysis estimating prevalence ratios (PR) with 95% confidence intervals (CI) for lack of awareness of risk factors and symptom of MM by country and sociodemographic factors.

Multivariable Model 1 (all countries combined)	**PR (95% CI)***		
	Sunburn in childhood	**Use of sunbed**	**Mole change**
	n=8198	*n=8204*	*n=8206*
Country			
Denmark	1.00 (Reference)	1.00 (Reference)	1.00 (Reference)
Northern Ireland	**0.78 (0.72 - 0.85)**	**1.65 (1.30 - 2.10)**	0.93 (0.66 - 1.31)
Norway	**1.38 (1.28 - 1.48)**	**2.99 (2.39 - 3.74)**	0.87 (0.60 - 1.26)
Sweden	**0.86 (0.79 - 0.93)**	**1.57 (1.22 - 2.00)**	1.36 (0.98 - 1.88)
Gender: Men vs. women	**1.23 (1.16 - 1.30)**	1.00 (0.87 - 1.16)	**1.86 (1.46 - 2.38)**
Age: ≥70 vs. 50-69	**1.12 (1.05 - 1.19)**	**1.29 (1.11 - 1.49)**	**1.65 (1.29 - 2.11)**
Cohabitation**: no vs. yes	1.00 (0.94 - 1.06)	**1.21 (1.05 - 1.41)**	**1.73 (1.35 - 2.22)**
Education: Lower vs. higher	**1.10 (1.03 - 1.16)**	**1.47 (1.25 - 1.72)**	**2.21 (1.61- 3.02)**
Multivariable Models 2.1-2.4	**PR (95% CI)#**		
	Sunburn in childhood	**Use of sunbed**	**Mole change**
2.1 Denmark	*n=1983*	*n=1984*	*n=1983*
Men vs. women	**1.29 (1.15 - 1.45)**	1.15 (0.78 - 1.69)	**1.97 (1.18 - 3.28)**
≥70 vs. 50-69	**1.15 (1.01 - 1.31)**	1.30 (0.86 - 1.99)	**2.61 (1.58 - 4.33)**
Living without a partner vs. living with a partner	1.00 (0.87 - 1.15)	**1.67 (1.10 - 2.53)**	**1.99 (1.19 - 3.34)**
Lower vs. higher education	**1.21(1.06 - 1.39)**	**2.18 (1.27 - 3.75)**	**2.46 (1.18 - 5.13)**

2.2 Northern Ireland	*n=2208*	*n=2209*	*n=2209*
Men vs. women	**1.33 (1.16 - 1.51)**	1.16 (0.88 - 1.54)	**2.50 (1.56 - 3.99)**
≥70 vs. 50-69	1.06 (0.92 - 1.23)	**1.53 (1.15 - 2.04)**	**1.80 (1.12 - 2.90)**
Living without a partner vs. living with a partner	1.11 (0.97 - 1.27)	1.03 (0.78 - 1.37)	**2.21 (1.35 - 3.62)**
Lower vs. higher education	1.15 (0.97 - 1.35)	**2.69 (1.67 - 4.34)**	**2.15 (1.03 - 4.48)**
2.3 Norway	*n=1980*	*n=1983*	*n=1985*
Men vs. women	**1.20 (1.09 - 1.31)**	1.00 (0.79 - 1.25)	**1.97 (1.07 - 3.61)**
≥70 vs. 50-69	1.10 (1.00 - 1.21)	1.04 (0.81 - 1.34)	0.84 (0.44 - 1.61)
Living without a partner vs. living with a partner	0.98 (0.88 - 1.08)	1.09 (0.85 - 1.41)	1.22 (0.65 - 2.31)
Lower vs. higher education	1.00 (0.92 - 1.09)	1.22 (0.98 - 1.53)	1.46 (0.83 - 2.58)
2.4 Sweden	*n=2027*	*n=2028*	*n=2029*
Men vs. women	**1.14 (1.01 - 1.30)**	0.80 (0.59 - 1.10)	1.37 (0.90 - 2.08)
≥70 vs. 50-69	**1.20 (1.05 - 1.37)**	**1.46 (1.06 - 1.99)**	1.53 (1.00 - 2.35)
Living without a partner vs. living with a partner	0.95 (0.82 - 1.09)	**1.51 (1.10 - 2.06)**	**1.55 (1.01 - 2.39)**
Lower vs. higher education	**1.21 (1.05 - 1.39)**	1.27 (0.91 - 1.77)	**3.22 (1.76 - 5.90)**

* PRs adjusted for country and sociodemographic variables; ** Living with a partner;

PRs adjusted for sociodemographic variables in separate models for each country.

Estimates for sociodemographic variables are indicated for the outcome group vs. reference group.

Significant results ($p \leq 0.05$) are presented in bold style.